

COURSE SYLLABUS

1. Program information

1.1. Institution	Petroleum-Gas University of Ploiești
1.2. Faculty	Petroleum Refining and Petrochemistry
1.3. Department	Petroleum Processing and Environmental Engineering
1.4. Field of study	Chemical engineering
1.5. Study cycle	Master Degree
1.6. Study program	Chemical Engineering for Refineries and Petrochemistry

2. Course information

2.1. Course title	Technologies for alternative fuels manufacturing		
2.2. Course coordinator	Assist prof. Matei Danuta		
2.3. Laboratory / seminar coordinator	Assist prof. Matei Danuta		
2.4. Project coordinator	-		
2.5. Year of study	1		
2.6. Semester *	1		
2.7. Evaluation type	Exam		
2.8. Course type - formative category **	DS	2.8. Type of subject matter ***	O

* the semester number is in accordance with the curriculum;

** fundamental = DF; domain = DD; speciality = DS; complementary = DC; thoroughgoing = DA; synthesis = DSI.

*** compulsory = C; optional = O; elective = E

3. Total estimated time (teaching hours per semester)

3.1. Number of hours per week	4	of which: 3.2.course	2	3.3. Seminars/laboratories	2	3.4 Project	-
3.4. Total hours from curriculum	56	of which: 3.5.course	28	3.6. Seminars/laboratories	28	3.8 Project	-
3.9. Time distribution							hours
Study of textbook, course support, bibliography and notes							40
Further reading in the library, on online platforms and fieldwork							-
Preparing seminars / laboratories, homework, portfolios and essays							50
Tutoring							-
Examinations							4
Other activities							
3.10. Total hours of individual study		94					
3.11. Total hours per semester		150					
3.12. Number of credits		6					

4. Prerequisites (where applicable)

4.1. of curriculum	<ul style="list-style-type: none"> ➤ Thermo catalytic Processes ➤ Organic chemistry, Petrochemistry, Environmental Protection
4.2. of skills	<ul style="list-style-type: none"> ➤ ➤

5. Requirements (where applicable)

5.1. of course	➤ Course room equipped with video projector and screen
5.2. of seminars/laboratory	➤ Laboratory equipped specific with related infrastructure

6. Specific competences

Professional competences	<p>PC1. Defines the process and designs technical components, including description, analysis, and advanced application of fundamental concepts and theories in the field of chemical engineering.</p> <p>PC2. Analysis of experimental data: determination of physico-chemical characteristics, structure and properties of petroleum products using complex analysis methods.</p> <p>PC3. Designs equipment and equipment for utilities: design of appliances, processes and installations with the application of knowledge in the field of chemical engineering.</p> <p>PC4. Analyzes production processes for improvement: real-time management of processes and installations in the chemical industry.</p>
Cross-curricular competences	<p>CC1. Ability to provide information and documentation in its field of activity, but also in related fields, in a language of international circulation.</p> <p>CC2. Efficient and effective performance of individual professional activities, under conditions of autonomy and professional independence.</p> <p>CC3. Ability to perform professional tasks as a team leader.</p>

7. Course objectives (based on the competence grid)

7.1. General objective	➤ The course aims to familiarize students with innovative processes of alternative fuels production
7.2. Specific objectives	<p>➤ Knowledge and identification of physico-chemical characteristics, specific combustion properties and unconventional fuels production processes</p> <p>➤ Ability to compare manufacturing technologies and the life cycle of non-conventional fuels with conventional fuels</p> <p>➤ Performance evaluation and identification of limitations due to the replacement or addition of such components in the MAS and MAC engines</p>

8. Contents

8.1. Course	Time	Teaching methods	Comments
8.1.1. General aspects regarding the involvement of car transport in environmental pollution. Current environmental protection legislation.	4	problem-solving, documenting on the web, exemplification	
8.1.2. Alternative fuels: green and blue hydrogen, oxygenated organic compounds (alcohols and ethers), biofuels: bioethanol, vegetable oils,	8	problem-solving, documenting on the web, exemplification	

vegetable and animal oils, biodiesel, biokerosene. Physical-chemical properties.			
8.1.3. Alternative fuel production technologies: LPG, CNG, GTL; green and blue hydrogen production; Technologies for the manufacture of oxygenated organic compounds; Biofuels manufacturing technologies	8	problem-solving, documenting on the web, exemplification	
8.1.4. Fuel storage and feeding systems	4		
8.1.5. Pollutant emissions of cars powered by alternative fuels	2		
8.1.6. Economic considerations regarding the use of unconventional fuels	2		
Bibliography 1. Knothe, G., Gerpen, J. V., Krah, J., <i>The biodiesel handbook</i> , AOCS Press, 2005. 2. Speight, J. G., <i>The refinery of the future</i> , Elsevier Science, Norwich, N.Y., Oxford, 2011. 3. Singh, A., Rathore, D., <i>Biohydrogen production: sustainability of current technology and future perspective</i> , Springer (India), 2017. 4. Twidell, J., Weir, T., <i>Renewable energy resources</i> , 2 nd Edition, Taylor & Francis, 2007. 5. Hubca, Gh., Lupu, A., Cociașu, C.A., <i>Biocombustibili, Biodiesel Bioetanol Sun diesel</i> , Editura Matrix Rom, Bucuresti, 2008. 6. *** Directive 2009/30/EC of the European Parliament and of the Council of 23 April 2009. 7. Lee, S., Speight, J.G., Loyalka, S.K., <i>Handbook of alternative fuel technologies</i> , CRC Press, 2007.			
8.2. Seminar / laboratory	Time	Teaching methods	Comments
8.2.1. Synthesis of biodiesel, characterization of the raw materials used	4	Consultation of literature and industry data, identification and use of standardized analysis methods	
8.2.2 Develop optimal recipes for biodiesel synthesis	4	Laboratory methods	
8.2.3. Complex analytical techniques for characterization of biodiesel	6	Identifying and using standardized methods, discussion and interpretation of the results	
8.2.4. Develop optimal synthesis of hydrogen through steam reforming of bioethanol over different types of catalyst	10	Identifying and using standardized methods, discussion and interpretation of the results	
8.2.5. Establishing experimental graphs correlations between different parameters of the process (temperature, space hour velocity, flow rate) with the hydrogen yield and	4		

selectivity			
Bibliography			
1. European Standards and Norms: EN 228, EN 590, EN 589; EN 14214; EN 15376.			
8.3. Project	Time	Teaching methods	Comments
Bibliography			

9. Correlation of the course contents with the demands of the epistemic community representatives, professional associations and representative employers in the field of the program

The course syllabus was developed in cooperation with representatives of engineering companies in Ploiești and Bucharest that have hired graduates of similar master programs.

10. Evaluation

Activity	10.1. Evaluation criteria	10.2. Evaluation methods	10.3. Percentage of final grade
10.4. Course	The evaluation takes into account the following categories knowledge: Theoretical knowledge evaluated by questions related to topics presented in the course	Written paper	20%
	Theoretical and applied knowledge evaluated through the final examination	Written paper	60%
10.5. Seminar / laboratory	General and detailed knowledge assessed by questions related to the topic and working conditions of the laboratory work	Assessment of laboratory activity; Drawing up the reports and interpreting the results of the experimental part	20%
10.6 Project	-	-	-
10.6. Minimum performance standard			
<p>Written examination:</p> <ul style="list-style-type: none"> ➤ For grade 5 it is necessary to obtain a minimum score of 50% for the theoretical knowledge, as well as to prove a minimum level of understanding and solving the applications in the subject (50% minimum) ➤ For grade 10 it is necessary to obtain a maximum score for theoretical knowledge and a complete and correct solving of the exam subjects (minimum 95%). <p>Laboratory activity:</p> <ul style="list-style-type: none"> ➤ Note 5 requires a minimum level of 50% for general knowledge as well as a minimum level of 			

understanding and use of laboratory-specific knowledge.

- Note 10 requires a minimum of 90% for laboratory-specific knowledge.

Signature/date
05.02.2025

Course coordinator



Seminar/laboratory coordinator



Project coordinator

-

Date of approval in the
department
20.03.2025

Head of department
Associate prof.PhD. Eng.
Neagu Mihaela



Dean
Assist. PhD.Eng. Duşescu Vasile Cristina

